WHAT IS CLAIMED IS:

1. A method for bidirectional data communication over a non-ideal transmission channel, comprising:

evaluating a channel response characteristic with respect to a first transmission signal parametric set;

varying said transmission signal parametric set;

re-evaluating said channel response characteristic with respect to said varied transmission signal parametric set; and

defining an optimal transmission signal parametric set for which the channel response characteristic allows optimization of at least one of a bit rate and a noise margin.

2. The method according to claim 1, wherein the channel response characteristic comprises:

a bit error rate; and

a signal-to-noise-ratio.

3. The method according to claim 2, wherein the transmission signal parametric set comprises:

a constellation size; and

a spectral allocation.

4. The method according to claim 3, wherein the spectral allocation is varied by varying a stop frequency thereof while maintaining a substantially constant start frequency thereof so as to determine a maximum spectral allocation at which communication can occur without exceeding a predetermined signal-to-noise ratio.

5. The method according to claim 3, wherein the constellation size is varied by encoding a signal in conformance with a plurality of discrete constellation sizes so as to determine a maximum constellation size at which communication can occur without exceeding a predetermined bit error rate.

6. The method according to claim 4, wherein the step of varying a constellation size further comprises:

varying constellation size while maintaining a substantially constant spectral allocation; and

repeating the constellation size varying step at a plurality of different discrete spectral allocations.

7. The method according to claim 5, wherein the step of varying a spectral allocation further comprises:

varying spectral allocation while maintaining a constant constellation size; and

repeating the spectral allocation varying step for a plurality of different discrete constellation sizes.

8. A method for providing digital communication via twisted pair telephone lines and the like, the method comprising the steps of:

defining a frequency spectrum having a predetermined bandwidth within which communication between two transceivers is to be performed, the frequency spectrum comprising a beginning (Fstart) at a low frequency end thereof and an end (Fstop) at a high frequency end thereof;

defining at least one channel within the frequency spectrum, the channel having an initial bandwidth which is substantially less than the bandwidth of the frequency spectrum;

communicating via the channel while varying the spectral allocation of the channel and while maintaining a constant constellation size;

determining a potential bit rate for each of a plurality of the spectral allocations at which communication was performed, the potential bit rate being determined using a potential constellation size for each spectral allocation determined via the measured signal to noise ratio (SNR) for that spectral allocation, a desired minimum signal to noise ratio (SNR) margin, and a given overall target bit rate;

selecting a spectral allocation having a highest one of the potential bit rates;

communicating while using the selected spectral allocation at its corresponding potential constellation size;

determining a value of a channel quality criteria;

continuing to communicate using the selected spectral allocation at its corresponding potential constellation size when the channel quality criteria indicates that the quality of the channel is above a predetermined threshold; and

reducing the constellation size to a new constellation size and determining the potential bit rate for the current spectral allocation and new constellation size when the channel quality criteria indicates that the channel quality criteria is below a predetermined threshold, then selecting a new spectral allocation having a highest one of the potential bit rates and repeating the previous three steps and this step until the channel quality criteria indicates that the channel quality is no longer below the predetermined threshold for the selected spectral allocation, the communicating step being performed with other than the maximum constellation size, when other than the maximum constellation size will result in the maximum potential bit rate and an acceptable channel quality criteria.

9. The method as recited in claim 8, wherein the step of defining at least one channel within the frequency spectrum comprises defining two channels within the frequency spectrum to facilitate full duplex communication.

10. The method as recited in claim 8, wherein the step of defining at least one channel within the frequency spectrum comprises defining a downstream channel and an upstream channel within the frequency spectrum.

11. The method as recited in claim 8, wherein the step of defining at least one channel within the frequency spectrum comprises defining an upstream channel proximate the beginning (FSstart) of the frequency spectrum and defining a downstream channel proximate the upstream channel, the downstream channel being formed within a higher frequency portion of the frequency spectrum than the upstream channel.

12. The method as recited in claim 8, wherein the step of defining at least one channel within the frequency spectrum comprises defining a downstream channel proximate the beginning (FSstart) of the frequency spectrum and defining an upstream channel proximate the downstream channel, the upstream channel being formed within a higher frequency portion of the frequency spectrum than the downstream channel.

13. The method as recited in claim 8, wherein the step of communicating via the channel while varying the spectral allocation of the channel comprises varying the spectral allocation of the channel among a finite number of predetermined spectral allocations.

14. The method as recited in claim 8, wherein the step of communicating via the channel while varying the spectral allocation of the channel comprises varying the spectral allocation among 9 different predetermined spectral allocations.

15. The method as recited in claim 8, wherein the step of communicating via the channel while varying the spectral allocation of the channel comprises sweeping the bandwidth between a minimum bandwidth and a maximum bandwidth.

16. The method as recited in claim 8, wherein the step of communicating via the channel while varying the spectral allocation of the channel comprises varying the bandwidth of the channel without varying a starting frequency (Fstart) of the channel.

17. The method as recited in claim 8, wherein the step of communicating via the channel while varying the spectral allocation of the channel comprises using quadrature phase shift keying (QPSK) to effect communication.

18. The method as recited in claim 8, wherein the step of determining a potential bit rate for each of a plurality of the spectral allocations comprises determining the potential bit rate for each spectral allocation according to the formula:

potential bit rate = (symbol rate) (FEC payload percentage) log2 (maximum constellation size);

wherein the symbol rate is determined by the bandwidth for each channel; and

wherein the constellation size is calculated according to the formula:

Constellation size =

{ 0 if <= (SNR - margin) < 10 dB;
4 if 10 dB <= (SNR - margin) < 16 dB;
8 if 16 dB <= (SNR - margin) < 19 dB;
16 if 19 dB <= (SNR - margin) < 22 dB;
32 if 22 dB <= (SNR - margin) < 25 dB;
64 if 25 dB <= (SNR - margin) < 28 dB;
128 if 28 dB <= (SNR - margin) < 31 dB;
256 if 31 dB <= (SNR - margin) }

and wherein furthermore for the case where the potential bit rate so calculated is greater than a given overall target bit rate, the constellation size is then subsequently reduced to the

smallest value for which the resulting potential bit rate equals or exceeds the overall target bit rate.

19. The method as recited in claim 8, wherein the step of determining a potential bit rate for each of a plurality of the spectral allocations comprises determining the potential bit rate for each spectral allocation according to the formula:

potential bit rate = (symbol rate) (FEC payload percentage) log2(constellation size);

wherein the symbol rate is determined according to the formula:

Symbol rate = bandwidth (-3dB points); and

wherein the constellation size is set separately for each spectral allocation according to the signal to noise ratio (SNR) for each spectral allocation, the overall target bit rate, and the desired minimum signal to noise (SNR) margin.

20. The method as recited in claim 8, further comprising the step of defining a tabulation of the potential bit rates.

21. The method for providing digital communication as recited in claim 8, further comprising the step of establishing a default communication link between two transceivers prior to the step of communicating via the channel while varying the spectral allocation of the channel.

22. The method for providing digital communication as recited in claim 21, wherein the step of establishing the default link comprises establishing a default link using pre-established communication parameters.

23. The method for providing digital communication as recited in claim 21, wherein the step of establishing the default link comprises establishing a full duplex default link.

24. The method for providing digital communication as recited in claim 21, wherein the step of establishing the default link comprises establishing an upstream and a downstream channel, each of the upstream and the downstream channels comprising a separate portion of the frequency spectrum.

25. The method for providing digital communication as recited in claim 21, wherein the step of establishing the default link comprises the steps of:

establishing an upstream channel proximate the beginning (FSstart) of the frequency spectrum, the upstream channel having a pre-defined bandwidth;

establishing a default downstream channel proximate the upstream channel, the downstream channel having a predetermined bandwidth; and

wherein the sum of the bandwidths of the upstream channel and the downstream channel is less than the bandwidth of the frequency spectrum so as to facilitate expansion of the downstream channel.

26. The method for providing digital communication as recited in claim 21, wherein the step of establishing the default link comprises the steps of:

establishing a downstream channel proximate the beginning (FSstart) of the frequency spectrum, the downstream channel having a pre-defined bandwidth;

establishing a default upstream channel proximate the downstream channel, the upstream channel having a predetermined bandwidth; and

wherein the sum of the bandwidths of the downstream channel and the upstream channel is less than the bandwidth of the frequency spectrum so as to facilitate expansion of the upstream channel.

27. The method for providing digital communication as recited in claim 21, further comprising the step of designating one of the two transceivers as a master transceiver and the other of the two transceivers as a slave transceiver so as to facilitate initialization of the default link without contention.

28. The method for providing digital communication as recited in claim 21, further comprising the step of using a contention routine to mitigate contention during initialization of the default link.

29. The method for providing digital communication as recited in claim 8, wherein the steps of communicating comprise communicating via quadrature amplitude modulation (QAM).

30. The method for providing digital communication as recited in claim 8, wherein the channel quality criteria comprises at least one of bit error rate (BER).

31. A method for enhancing a bit rate and/or margin at which quadrature amplitude modulated (QAM) communication is performed, the method comprising the steps of:

defining a plurality of spectral allocations, each spectral allocation having an approximately equal starting frequency; and

defining a combination of one of the defined spectral allocations and a constellation size at which bit rate and/or margin is enhanced.

32. An xDSL transceiver comprising

a transmit spectrum control circuit for varying a spectral allocation with which encoding is performed;

a transmit constellation size control circuit for varying a constellation size with which encoding is performed; and

wherein the transmit spectrum control and transmit constellation size control circuits cooperate to define a combination of spectral allocation and constellation size at which bit rate and/or margin is enhanced.

33. The xDSL transceiver as recited in claim 32, wherein the transmit spectrum control circuit is configured to vary a spectral allocation of at least one of a downstream channel and an upstream channel.

34. The xDSL transceiver as recited in claim 32, wherein the transmit spectrum control circuit is configured to vary the spectral allocation in discrete increments.

35. The xDSL transceiver as recited in claim 32, wherein the transmit spectrum control circuit is configured to sweep a stop frequency of at least one of a downstream channel and an upstream channel in a substantially continuous manner.

36. The xDSL transceiver as recited in claim 32, wherein the transmit spectrum control circuit is configured to sweep a symbol rate and center frequency of at least one of a downstream channel and an upstream channel in a substantially continuous manner.

37. The xDSL transceiver as recited in claim 32, wherein the transmit spectrum control and transmit constellation size control circuits are configured to cooperate to vary the constellation size while maintaining a substantially constant spectral allocation.

38. The xDSL transceiver as recited in claim 32, wherein the transmit spectrum control and transmit constellation size control circuits are configured to cooperate to vary the spectral allocation while maintaining a constant constellation size.

39. The xDSL transceiver as recited in claim 32, further comprising a receive spectrum control circuit for varying a spectral allocation with which decoding is performed.

40. The xDSL transceiver as recited in claim 32, further comprising a receive constellation size control circuit for varying a constellation size with which decoding is performed.

41. A method for enhancing a bit rate and/or margin at which quadrature amplitude modulated (QAM) communication is performed, the method comprising the steps of:

varying a spectral allocation and constellation size with which communication is performed, wherein the spectral allocation is varied by varying a start frequency and a stop frequency thereof; and

defining a combination of spectral allocation and constellation size at which bit rate and/or margin is enhanced.

42. The method as recited in claim 41, wherein the step of varying a spectral allocation comprises varying the start frequency and stop frequency in discrete increments.

43. The method as recited in claim 41, wherein the step of varying a spectral allocation comprises sweeping the start frequency and stop frequency in a substantially continuous manner.

44. The method as recited in claim 41, wherein the step of varying a constellation size comprises utilizing a plurality of different constellation sizes so as to determine a maximum constellation size at which communication can occur.

45. The method as recited in claim 41, wherein the step of varying a constellation size comprises utilizing a plurality of different constellation sizes so as to determine a maximum constellation size at which communication can occur without exceeding a predetermined bit error rate (BER).

46. The method as recited in claim 41, wherein the step of varying a spectral allocation and constellation size comprises varying constellation size while maintaining a substantially constant spectral allocation and repeating this step for a plurality of different spectral allocations.

47. The method as recited in claim 41, wherein the step of varying a spectral allocation and constellation size comprises varying spectral allocation while maintaining a constant constellation size and repeating this step for a plurality of different constellation sizes.

48. A method for enhancing quadrature amplitude modulated (QAM) communications, the method comprising the steps of:

varying a spectral allocation and constellation size with which communication is performed, wherein the spectral allocation is varied by varying a stop frequency thereof while maintaining a substantially constant start frequency thereof, so as to mitigate high frequency content of the spectral allocation; and

defining a combination of spectral allocation and constellation size at which bit rate is enhanced when a target bit rate cannot be achieved and defining a combination of spectral allocation and constellation size at which margin is enhanced when the target bit rate is achieved.

49. A method for enhancing quadrature amplitude modulated (QAM) communications, the method comprising the steps of:

varying a spectral allocation and constellation size with which communication is performed, wherein the spectral allocation is varied by varying a stop frequency thereof while maintaining a substantially constant start frequency thereof, so as to mitigate high frequency content of the spectral allocation; and

defining a combination of spectral allocation and constellation size at which bit rate is enhanced while providing at least one of a minimum margin and a maximum bit error rate.

50. A method for enhancing quadrature amplitude modulated (QAM) communications, the method comprising the steps of:

varying a spectral allocation and constellation size with which communication is performed, wherein the spectral allocation is varied by varying a stop frequency thereof while maintaining a substantially constant start frequency thereof, so as to mitigate high frequency content of the spectral allocation; and

defining a combination of spectral allocation and constellation size at which margin is enhanced while providing a desired bit rate

51. A method for enhancing quadrature amplitude modulated (QAM) communications, the method comprising the steps of:

varying a spectral allocation and constellation size with which communication is performed, wherein the spectral allocation is varied by varying a stop frequency thereof while maintaining a substantially constant start frequency thereof, so as to mitigate high frequency content of the spectral allocation; and

defining a combination of spectral allocation and constellation size at which a desired bit rate is achieved and margin is maximized.

52. A method for enhancing quadrature amplitude modulated (QAM) communications, the method comprising the steps of:

varying a spectral allocation and constellation size with which communication is performed, wherein the spectral allocation is varied by varying a stop frequency thereof while maintaining a substantially constant start frequency thereof, so as to mitigate high frequency content of the spectral allocation; and

defining a combination of spectral allocation and constellation size at which bit rate is enhanced when a target bit rate cannot be achieved and defining a combination of spectral allocation and constellation size of which bit error rate is reduced when the target bit rate is achieved.

53. A method for enhancing quadrature amplitude modulated (QAM) communications, the method comprising the steps of:

varying a spectral allocation and constellation size with which communication is performed, wherein the spectral allocation is varied by varying a stop frequency thereof while maintaining a substantially constant start frequency thereof, so as to mitigate high frequency content of the spectral allocation; and

defining a combination of spectral allocation and constellation size at which bit error rate is minimized while providing a desired bit rate.

54. A method for enhancing quadrature amplitude modulated (QAM) communications, the method comprising the steps of:

varying a spectral allocation and constellation size with which communication is performed, wherein the spectral allocation is varied by varying a stop frequency thereof while maintaining a substantially constant start frequency thereof, so as to mitigate high frequency content of the spectral allocation; and

defining a combination of spectral allocation and constellation size at which a desired bit rate is achieved and bit error rate is minimized.

55. A bidirectional data communication device of the type in which spectrum allocation and constellation size are communication parameters, comprising:

a transmitter portion including:

an encoder coupled to encode digital data transmissions;

a modulator coupled to modulate encoded digital data transmissions;

a digital to analog converter coupled to convert modulated digital data transmissions into analog data transmissions;

an electronic hybrid coupled to separate received analog data from transmitted analog data;

a receiver portion including:

an analog to digital converter coupled to convert the received analog data into digital data;

a demodulator coupled to demodulate received digital data;

a decoder coupled to decode demodulated received digital data;

a transmit spectrum control coupled to vary a spectrum allocation with which the encoder encodes the digital data transmissions and with which the modulator modulates the encoded digital data transmissions; and

a transmit constellation size control coupled to vary a constellation size with which the encoder encodes digital data transmissions.

56. A bidirectional data communication device of the type in which spectrum allocation and constellation size are communication parameters, comprising:

a transmitter portion including:

an encoder coupled to encode digital data transmissions;

a modulator coupled to modulate encoded digital data transmissions;

a digital to analog converter coupled to convert modulated digital data transmissions into analog data transmissions;

an electronic hybrid coupled to separate received analog data from transmitted analog data;

a receiver portion including:

an analog to digital converter coupled to convert the received analog data into digital data;

a demodulator coupled to demodulate received digital data;

a decoder coupled to decode demodulated received digital data;

a receive spectrum control coupled to vary a spectrum allocation with which the demodulator demodulates the received digital data and with which the decoder decodes the demodulated received digital data; and

a receive constellation size control coupled to vary a constellation size with which the decoder decodes demodulated received digital data.